INSTRUCT-O-GRAM

THE HANDS-ON TRAINING GUIDE
FOR THE FIRE INSTRUCTOR

The "Safety Engine" Concept - Part I

TRAINING OBJECTIVE

Following this segment, the student will be able to describe the Safety Engine Concept and how the implementation of such a program will promote fire ground survival while supporting the requirements of a dedicated rapid intervention team.

METHODS OF INSTRUCTION

- Lecture
- Demonstration
- Practical Exercises

INSTRUCTIONAL AIDS

- Course Outline
- Video Projection Unit
- Department R.I.T. Standard Operating Guideline / Procedure
- USFA Technical Reports
- NIOSH Reports
- N.F.P.A. Fire Investigation Reports
- Smoke Generator (Synthetic/Non-toxic)
- Acquired structure or burn house training facility

ESTIMATED TEACHING TIME

8-16 Hours - quarterly review recommended

PERFORMANCE OBJECTIVES

Following this segment, the student will:

- Identify the roles and responsibilities of a traditional rapid intervention team as per your department's standard operating guidelines/procedures.
- Define the differences between the R.I.T. philosophy and the Safety Engine Concept.
- Describe how proactive fire ground ladder placement, security bar removal, backup line placement, and four-sided/entry way lighting can help support firefighter survivability.
- Define fire ground forecasting and cue-based decision-making as it pertains to the Safety Engine Concept.
- Define the primary roles and responsibilities of the Safety Engine Officer and Crew.
- Describe the purpose of a rescue action plan.
- Identify the advantages and disadvantages of the Safety Engine Concept versus traditional rapid intervention operations.
- Identify the importance of assigning a Safety Engine Crew early within the first alarm assignment.

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REFERENCES

- National Fire Protection Association. (2002 ed.). NFPA 1500: *Standard on Fire Department Occupational Safety & Health Program*. Quincy, MA: Author
- National Fire Protection Association. (2002 ed.). NFPA 1521: *Standard for Fire Department Safety Officer*. Quincy, MA: Author
- National Fire Protection Association. (2000 ed.). NFPA 1561: *Standard on Emergency Services Incident Management System*. Quincy, MA: Author
- Occupational Safety & Heath Administration. OSHA 1910.134 *Respiratory Protection Standard (Two-in/ two-out policy)*
- National Fire Protection Association. (2000) *Residential Fire. Keokuk, Iowa.* Quincy, MA: Duval, F. Robert
- International Association of Fire Chiefs Health and Safety Committee. (2000) *Executive Summary and Implementation Guide for OSHA Respiratory Protection Standard, 29 CFR 1910.134.* Fairfax, VA

ESTIMATED TEACHING TIME

As the pursuit of increased staffing and budgetary support continues, ask yourself, what's happening on the modern fire ground? Are we modifying our tactics to support the safety and survivability of our personnel during these troubling times, or are we taking short cuts hoping to make due? Fire departments across the country face these same taxing issues, some worse then others. Unfortunately, our means of overcoming these limitations has put us at a greater risk.

Look around your fire ground, is it supportive of firefighter survival, or is it lacking those critical safety features previously established during every firefight? Critical factors such as adequate scene lighting for accountability and operational effectiveness, ladders for secondary means of egress/access, continual scene size-ups, an established Incident Safety Officer? Have these and other critical safety measures been eliminated from the modern fire ground, if so, why? Do we blame these shortages on budget constraints, staffing limitations, or is it just a failure to modify and/or realign our fire ground tactics?

As I continue to research fatal incidents of the recent past, I constantly find myself asking, are we doing all we can to make the modern fire ground safe and survivable? Are we utilizing the available resources to establish a fire ground that supports safety and survivability for all firefighters involved? While you ponder these thoughts, consider the following incidents; Worcester, MA (2 R.I.T. teams (four firefighters) initially deployed to rescue lost crewmembers conducting an upper floor search - 6 fatalities), Kansas City, MO (6 R.I.T. teams (twelve firefighters) initially deployed to rescue a lost/disoriented member in a smoke filled warehouse – 1 fatality), Austin, Texas (1 firefighter severely burned following a flashover – rescued via a passing firefighter who had heard the screams of the injured firefighter), Honolulu, HI 1 firefighter overcome by smoke, disoriented, lost, – rescued via an existing crewmember).

The aforementioned incidents are proven examples that we must do more. Case and point, rapid intervention teams used in what is considered their traditional sense are NOT the ultimate answer to our fire ground problems.

This month we will introduce the Safety Engine Concept as a secondary means of developing a more "survivable" fire ground. This concept shines light on the fact that if we think about our own careers, most will agree that the likelihood of us facing a self-rescue situation is more probable than an actual rescue requiring outside assistance. If this is indeed the case, which I believe it is, then why don't we place more focus on establishing a fire ground that is more reflective of a "self-rescue" effort?

As Gordon Graham, Risk Manager of the California Highway Patrol once said, ***"If it's predictable, it's preventable."*** The Safety Engine Concept adopts this same philosophy in that it incorporates fire ground forecasting (a means of predicting what might occur) based on cue-based decision-making to initiate proactive measures, which support firefighter self-survival.

PLEASE NOTE: *This in no way should be interpreted as a means of lessening the importance of rapid intervention teams. Rapid intervention teams are an absolute priority. The Safety Engine Concept is simply designed to be a proactive and/or preventative means of fire fighter rescue.*

PRESENTATION

The Safety Engine Concept in Comparison

- N.F.P.A. 1500 as is commonly interpreted, requires a team of no less then two members (I.R.I.T.) dedicated for firefighter rescue. This team of two (2) is encouraged to be stationary, non-committed, and non-fatigued. Once additional personnel arrive, a designated R.I.T. Team of four (4) shall be established.

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- O.S.H.A. 1910.134 (2 in/2 out – The Final Ruling) requires no less than two personnel outside the IDLH atmosphere available for firefighter rescued if the need arises. One of the two individuals located outside the IDLH atmosphere may be assigned to an additional role, such as incident commander in charge of the emergency or safety officer, so long as this individual is able to perform assistance or rescue activities without jeopardizing the safety or health of any firefighter working at the incident.
- The Safety Engine Concept supports the philosophy of no less than two (2) prefer four (4) personnel responsible for establishing a fire ground that supports/promotes "firefighter self-rescue" as it's primary duty, and firefighter rescue as it's secondary role/responsibility. The Safety Engine Concept is designed to be in compliance with NFPA 1500 and OSHA 1910.134.

Traditionally, a dedicated rapid intervention team was required to be in a stationary, non-committed position at or near the Command Post. The Safety Engine Concept in contrast, supports a crew that initiates proactive measures thereby reducing the possibility of deployment while at the same time remaining available for rescue if necessary. Simply put, common sense, discipline and proper training of all personnel assigned as Safety Engine personnel will ensure their readiness. No Safety Engine Crew should take on a task or assignment that will jeopardize their safety or that of a fellow firefighter if immediately abandoned.

The state of readiness to many departments has traditionally been a non-active roll, fully equipped, standing stagnant. The Safety Engine requires personnel to proactively deploy/initiate the tools and equipment that not only support the safety and survivability of firefighters but also allows for a quicker more effective rescue effort.

DISPATCH PROCEDURE

A Safety Engine should be assigned to every "high hazard" incident. High hazard incidents include, but are not limited to: hazardous materials incidents requiring entry, specialized rescue operations and any suspected/confirmed working fire. It is recommended that the third (3) due/arriving company be assigned as the Safety Engine to initiate proactive survival measures for initial arriving units.

Case studies and numerous state and federal standards mandate an early I.R.I.T./Safety Engine assignment. Departments who currently request a supplemental unit for the initial alarm need to reconsider the safety of the initial arriving crews, the vulnerability to sudden injury and or death is immediate, and the decision to assign a Safety Engine Crew should equally reflect the potential hazards involved. The recent fatalities in Houston, Texas (2/14/00) and Keokuk, Iowa (12/22/99) strongly support the necessity of a first alarm Safety Engine assignment.

RESPONSE

When assigned as a Safety Engine, personnel should follow normal operating guidelines and proceed directly to the emergency scene. While responding, Safety Engine personnel should begin to prepare a rescue action plan for possible deployment, identifying the necessary tools, potential hazards, construction of the building involved, personnel assignments, etc.

Upon arrival, the Safety Engine Officer should report directly to the Incident Commander or IRIT Officer to notify of the teams arrival while obtaining a detailed briefing of the current assignments. If appropriate, the Safety Engine Officer should then relieve the IRIT team leader and begin reviewing the status of on scene personnel, and the established tactical worksheet.

STAFFING

Initial staffing will consist of no less than two (2) (upgraded to four upon arrival – combine with IRIT team on scene. Complies with: NFPA 1500 designation of a "dedicated" Rapid Intervention Crew). Minimum Safety Engine crew (1) Firefighter, (1) Officer. If staffing level is equal (4) four or more, the Safety Engine Crew should relieve the on scene IRIT members for an additional assignment.

The important fact to remember is, if we minimize the number of personnel assigned to the Safety Engine or we delay the assignment to a late arriving company we jeopardize the safety and survivability of the personnel operating on the incident scene.

COMMUNICATIONS

Upon arrival of the Safety Engine Crew, the Safety Engine Officer shall identify a tactical channel to be assigned to Safety Engine operations prior to deployment. If the assigned Safety Engine Crew is from another agency, the Incident Commander should confirm the operating frequency and if necessary provide a portable radio for communications.

OPERATIONAL GUIDELINES

All Safety Engine personnel should follow the pre-established accountability procedures (i.e. adhere their accountability tags to the unit passport) prior to performing any additional duties.

As the Safety Engine arrives on the scene of a high-hazard incident, the initial action of the Safety Engine Officer is to meet and confer with the Incident Commander to identify any critical issues of concern, fire ground assignments and accountability. As the primary member of the Safety Engine crew the Safety Engine Officer is responsible for identifying the number of personnel assigned to the hazard zone, their primary assignments and the available equipment necessary for their rescue if the need be. The Safety Engine Officer should also remain at the command post to oversee personnel accountability, unit assignments, fire ground communications, and general tactical operations.

INCIDENT SIZE-UP (360° HOT LAP)

Arriving Safety Engine personnel are required to perform an immediate "Hot Lap" (360♈ size-up) of the occupancy involved. Safety Engine members are instructed to evaluate the following: building construction, fire travel, means of access/egress, hose line placement, potential collapse hazards, utility control verification, etc. Upon completion of the initial "Hot Lap"/ size-up, Safety Engine crewmembers should immediately report their findings to the Safety Engine Officer and begin to establish a rescue action plan. Reevaluation (360♈ "Hot Laps) should be completed every 15 minutes to ensure an accurate and updated rescue action plan exists.

Rescue Action Plan Criteria:

1. Number of personnel lost/trapped/missing
2. Air supply needs
3. Last know location
4. Where to enter
5. How – tool requirements, specialized equipment needs
6. Search Techniques
7. Recon reporting

FIRE GROUND FORECASTING/CUE-BASED DECISION-MAKING

Throughout a firefighters career he/she will become acutely aware of the various sights and sounds commonly encountered during fire ground operations. It's these subtle cues that enable an Incident Commander to develop and implement effective strategy & tactics to safely extinguish a fire. The philosophy of the Safety Engine Concept is to embrace this realm of thinking, in hopes that the mobilized Safety Engine personnel will immediately act upon any signs (usual or telltale) that indicate a potential hazard and proactively deploy the necessary fire ground survival initiatives (i.e. P.A.S.S. alarm activation – request an immediate P.A.R. and/or situation report).

DEVELOPING A TOOL CACHE

The Safety Engine should be considered a self-supportive unit, independent of all other firefighting operations. The Safety Engine Crew should establish a "Tool Cache" consisting of the necessary tools to initiate an immediate rescue of a down or trapped firefighter. Additional specialized tools (such as rescue airbags, high lift jacks, etc.) may be necessary depending on the situation. Tools of immediate concern to the Safety Engine Crew should include: Extra S.C.B.A.(s)/rescue packs w/ face piece and cylinder (may need multiple types if more then one type is in use), hand tools, lights, portable radios, ladders (folding/extension), search ropes, and medical supplies.

PERSONNEL MONITORING

In 1997, a firefighter died on the fire ground after entering a structure fire five (5) separate times, each time with a fresh air supply. In 1999, (25) firefighters died as the result of a heart attack on the fire ground. Could some of these deaths have been prevented through proactive interventions? The reality is, we will never know, yet it only makes good sense to utilize available personnel (i.e. Safety Engine personnel) to monitor personnel entering the hazard zone for signs of fatigue, proper rehab, etc. Proactively, the Safety Engine crew may intervene and direct these personnel to be reassigned to rehab or medical screening prior to re-entering the hazard zone.

INCIDENT SAFETY (ISO SUPPORT)

The purpose of the Safety Engine Concept is to prevent the need for firefighter rescue. As fire departments across the country struggle with staffing issues, more and more departments are cutting critical positions on the fire ground to make up for the shortages. The position of a dedicated Incident Safety Officer (ISO) is one that is very quickly deleted from most "short staffed" fire grounds. Fortunately, the Safety Engine Concept provides a means of compensating for this reoccurring issue. By placing 2-3 firefighters on the fire ground that are constantly identifying and addressing critical safety factors, the duties of the ISO are once again being addressed. In the absence of a dedicated ISO, the Safety

Engine Crew in essence becomes the substituted working eyes, ears, and hands of the ISO.

PROACTIVE LADDERS

Firefighters are faced with a multitude of rapidly changing conditions including: rapid-fire development, low-pressure alarm activations, structural collapse, disorientation, etc. Unfortunately, many of these occurrences happen with little or no warning, which ultimately leads to death or injury. As a proactive means of providing a rapid means of escape, the Safety Engine Concept strongly supports the initiation of proactive ladder placement as a secondary means of escape. Proactive ladders not only provide a means of egress for the endangered firefighter, they also serve as a secondary means of access for the rescue of both civilians and firefighters.

Ground ladders placed by the Safety Engine Crew should be placed at an exaggerated angle (approx. 60° - to allow for rapid decent maneuvers and/or better weight distribution during rescue operations) with the tip of the ladder resting just beneath the windowsill or ledge. Once a ladder is in position, Safety Engine personnel should immediately notify the IC and inform him/her that a secondary means of egress has been established (i.e. "Safety Engine to command, notify interior crews that a secondary means of egress has been established on sides 3 and 4 of the structure.")

SECURITY BAR/OBSTRUCTION REMOVAL

Secondary means of egress in a fire situation often times become the first accessible window in the immediate area. Unfortunately, not all windows can be considered a suitable means of egress due to obstructions and/or security bars. Once again, as a duty of the Safety Engine and in support of firefighter survivability, the Safety Engine Concept recommends removing the security bars (in the immediate operational area) PROACTIVELY. A firefighter lost, disoriented, low on air, or being overtaken by fire has little time to react, egress must be immediate. Few if any RIT teams can react quick enough in this situation. The answer is quite simple; remove security bars PROACTIVELY, before the Mayday occurs.

BACK-UP/SAFETY LINE

Firefighters who are immediately overrun by fire, how do we intervene? How do we provide the necessary relief? Pull a backup line, right? Can this be done in a timely manner in order to rescue our fellow brother(s)/ sister(s)? Why not have a backup line deployed PROACTIVELY (strategically located at the point of entry and/or secondary means of access - base of a ladder) ready for immediate deployment versus sitting in the bed of the first or second due company?

SCENE/ENTRY POINT LIGHTING

One of the most frequently published contributing factors leading to firefighter fatalities continues to be a lack of accountability. The establishment of four-sided scene lighting enhances fire ground accountability, fire ground safety and operational effectiveness. Secondly, the addition of entry point lighting allows lost or disoriented firefighters a point of orientation and potentially a means to escape an otherwise fatal situation. In 1999, seven (7) firefighters died when they became lost or disoriented inside burning structures. No one will ever know for sure if entry point/ exit lighting could have saved their lives, but it's certainly worth considering in hope of preventing similar occurrences?

COMMUNICATIONS

The fire ground "Mayday," a quick, urgent and chaotic event that immediately sends the hearts of those involved into overdrive. The successful management of a fire ground mayday hinges upon effective fire ground communications and quick effective management of the given situation. Based on events of the recent past, we know one of the most critical obstacles facing the IC is fire ground communications. Incident Commanders should PROACTIVELY assign a secondary tactical channel to Safety Engine personnel to allow for uninterrupted and immediate communications during deployment operations.

PROGRESS/ACCOUNTABILITY REPORTING

Once again, the issue of accountability on the fire ground begins to surface as a critical factor to fire ground survival. Regardless of your methods/system, accountability systems are dependent on "situation/ progress reporting" / C.A.N. reporting (Conditions/ Actions/ Needs) and timely personnel accountability reports. As a means of establishing a fire ground that supports survivability, we must require all operating personnel to provide timely situational/ C.A.N. reports and timely PAR checks. Situation/C.A.N. reporting and PAR checks enable the Safety Engine to adequately track and deploy the necessary equipment in an effective manner if the need arises. Failure to provide adequate information to the IC through situation reporting and/or PAR checks causes a delay in deployment, which ultimately can contribute to an unnecessary loss of life.

DEPLOYMENT

Upon receipt of a "Mayday" report, the Incident Commander should immediately request for a personnel accountability report to accurately identify the number of personnel involved and last known location. Once an

accurate personnel accountability report is complete, the Safety Engine Officer should implement his/her rescue action plan, deploying Safety Engine personnel (with hand tools, additional S.C.B.A., T.I.C. camera if available, and search lines).

CAUTION: Unless entrapment conditions are immediately known, initial Safety Engine response personnel SHOULD NOT BE DEPLOYED WITH A LARGE AMOUNT OF HAND TOOLS. Initial deployment personnel should concentrate on rapidly locating the downed/trapped member, securing a secondary air supply, and organizing an effective rescue/removal plan.

Safety Engine personnel should immediately attempt to gain access via the closest/safest route possible (typically a preset ladder or window). Once the Safety Engine gains access, their search should be conducted using a life safety rope secured with a clip to a stationary object (dead load preferred) outside the structure. The member on the entry team should deploy the rope upon entering and keep deploying the rope until the destination is reached.

Upon locating the downed firefighter(s), Safety Engine personnel should immediately communicate their findings to the IC (via a C.A.N. Report) while assessing the surrounding area for any potential hazards (weakened floors, secondary collapse hazards, etc.) that may jeopardize their personal safety. Immediately following the safety assessment, members should perform a quick air supply survey (check for breathing, listen near his/her face piece, if nothing is heard, check purge/bypass valve, if still nothing, quickly assess cylinder valve/gauge). If it is determined that the downed firefighter is out of air, immediately perform a quick air supply exchange (using the additional S.C.B.A. or rescue pack). Once the extent of the rescue operation is known, the Safety Engine Officer should request the necessary tools, equipment and personnel to carryout the rescue operation.

TERMINATION OF ASSIGNMENT

The Safety Engine like a rapid intervention team should not be returned to service until overhaul is complete. If we consider the fact that structural stability and firefighter fatigue are at their absolute worst during overhaul, common sense says we need to maintain a team for potential rescue during this vulnerable time.

POST INCIDENT ANALYSIS (REVIEW/REVISE/IMPLEMENT)

As has become a standard practice for most departments across the country, a post-incident analysis should be completed after every incident in which a Safety Engine is dispatched. The post-incident analysis depending on the severity/complexity of the incident may or may not be a formal session. The important point to remember is that we must take advantage of every opportunity to review, revise and update our operations and the PIA is an excellent tool for operational improvements.

DEDICATION

As I conclude this program, I would like to extend my sincere thanks to the brothers and sisters of the Worcester, MA, Kansas City, MO, Austin, TX, Honolulu, HI, Keokuk, IA, and Houston, TX Fire Departments for sharing with us the many lessons learned and the tragic events that led to their injury or loss through the various video clips and investigative reports that have circulated the fire service.

This program is dedicated to ensuring that we the fire service learn from the past in hopes of providing a safer future.

ACKNOWLEDGEMENT

Tim Sendelbach is a 19 – year student and educator of the fire & emergency services, currently serving as Chief of Training for Savannah Fire & Emergency Services, Georgia. Chief Sendelbach formerly served as Assistant Fire Chief for Missouri City Fire & Rescue Services, Texas and as a Firefighter/Paramedic with the Kansas City, Kansas Fire Department. Tim has earned B.S. degrees in Fire Administration, Arson and an A.S. degree in Emergency Medical Care from Eastern Kentucky University.

Tim is the editor of the International Society of Fire Service Instructors (ISFSI) monthly publication The Instructor and a contributing editor to numerous other publications including the Fire & Emergency Television Network (FETN) in which he is the writer/developer of the featured "SURVIVAL!" program.

Tim is currently the President of the ISFSI, and a student of the National Fire Academy's Executive Fire Officer (EFO) Program.